Growth; Universe Books, 1972) and population biologist Paul Ehrlich. Hengeveld argues that we are depleting resources and polluting the environment faster than human survival can bear — literally “wasting” the planet.

To his credit, Hengeveld squanders no space on using resources more efficiently in support of economic growth. He homes in on how the human population already exceeds Earth's capacity. His basic argument is convincing, but most of the book is a rambling litany on how we waste our world. When Hengeveld finally commits to how much Earth can carry — and gives one paragraph of solutions — he proposes that we reduce the population to less than one billion, through contraception and voluntary sterilization.

Aside from the plan's obvious difficulties, it points the finger at the populations that are growing fastest, not those consuming most. Indeed, Hengeveld says that 75% of Earth-threatening future population growth will be in “poor, non-developing countries”. By contrast, the United Nations estimates that the least-developed countries (LDCs) will contribute around 38% of growth up to 2050.

More important is that the LDCs have an annual energy consumption of less than 500 kilograms of oil equivalent per capita, compared with 7,045 kg in the United States. So a Haitian or Ethiopian family of 14 uses less and pollutes less than a single US citizen.

Any serious discussion of planetary capacity must address this. Paul and Anne Ehrlich's most recent analyses give equal weight to population, inequality and power. But Hengeveld does not engage much with these ideas, nor with research that explores how a steady-state society might live, work, eat and govern.

One of Humes's interviewees suggests that the liberty at the heart of the American dream is a call to the financial freedom of reduced consumption, rather than bondage to belongings. Messages such as these — which Humes dubs “the new normal” — strike a chord in these times of recession, resource scarcity and uncertain futures. ■

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CORVID COGNITION

Feathered apes

Nicola Clayton is fascinated by the mind of the crow, and the bird's ancient links with humankind.

I have often wondered whether it is an evolutionary accident that our planet ended up being ruled by apes. What would it have been like to live on a planet of the crows, with humans serving as mere intellectual curiosities for our avian masters — those big-brained, beady-eyed, feathered apes?

The idea that these birds could be as intelligent as our primate cousins triggers mixed reactions. Dismissed by some as ‘birdbrained’, the corvids have an alien intelligence that disturbs others, who are reminded of Alfred Hitchcock's 1963 thriller *The Birds*. Yet a select few of us respect them. These few include John Marzluff and Tony Angell, whose delightful

Gifts of the Crow:
How Perception,
Emotion and Thought
Allow Smart Birds to
Behave Like Humans
JOHN MARZLUFF AND
TONY ANGELL
Free Press: 2012. 304 pp.
\$25, £15.97

Gifts of the Crow is their second book together on this *rara avis*, following *In the Company of Crows* (Yale University Press, 2005).

The authors argue that crows share seven striking similarities with humans: language, delinquency, frolic, passion, wrath, risk-taking and awareness including

Pathfinders: The Golden Age of Arabic Science

Jim Al-Khalili (Penguin, 2012; £9.99)

Medieval Islam helped to shape science, and physicist Jim Al-Khalili describes the life and work of some of its great thinkers. These polymaths pioneered the study of refraction, were first to use inhalant anaesthetics and calculated the height of the atmosphere.

Quantum Man: Richard Feynman's Life in Science

Lawrence M. Krauss (Norton, 2012; \$15.95)

An account of Feynman's science, this book documents the effort and insight informing work that fundamentally defined how we look at quantum theory. (See Leonard Mlodinow's review: *Nature* **471**, 296–297; 2011.)

insight such as gift-giving — hence the book's name. Might these similarities be behind corvids' strong associations with humans, and our endless curiosity about these ominous-looking creatures?

Marzluff, an avid ornithologist and wildlife scientist, and Angell, author and illustrator of award-winning natural history books, give us a series of intriguing stories and stunning illustrations that together reveal the sophisticated cognitive abilities of crows and their relationship with humans, which have inspired art, poetry, legend and myth. Anecdotes abound, interspersed with the science on crow behaviour and brains.

The authors persuasively describe the high intelligence of members of the crow family. They detail how corvids use and manufacture tools and show forethought, for instance by planning where to stash their food for tomorrow's breakfast. They have remarkable memories for where they have hidden their caches. The star of this show is surely the Clark's nutcracker (*Nucifraga columbiana*): this bird hides around 33,000 seeds in 6,000–7,000 locations in the autumn each year, and relies on its stunning spatial memory to recover them over the following winter and spring. Corvids devote much of their time to play — important, say Marzluff and Angell, because we “build better brains through play”.

The authors relate many examples of corvid ingenuity. Renowned as devious tricksters, the birds can also be creative; for example, rooks have been observed using smouldering cigarette ends to smoke parasites out from under their wings. And thanks to a series of scientific experiments on the performance of rooks, jays and crows, we now know that Aesop's fable *The Crow and the Pitcher*, in which a bird used stones to raise the water level in a jug to quench its thirst, is fact rather than fiction.

This avian family is

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also socially sophisticated, and its members go to great lengths to outsmart the competition in finding and protecting food. Jays, for example, keep track of which particular bird was watching when they hid their food, and take protective action to minimize the chance of these potential thieves stealing it. But they only do so if they themselves have been thieves. This reveals a complex

MIGHT CORVIDS' SIMILARITY WITH HUMANS BE BEHIND OUR ENDLESS CURIOSITY ABOUT THESE OMINOUS-LOOKING CREATURES?

form of social cognition called experience projection — in essence, putting yourself in someone else's shoes. Crows can even recognize individual humans and determine which are dangerous and which are not.

The intellectual capabilities of crows challenge assumptions about the uniqueness of the intelligence of humans and other apes. Cognition must have arisen independently in corvids and primates, because not all birds and mammals share their brainpower.

Furthermore, the architecture of the avian brain is distinct from that of the mammalian brain: it lacks the layered structure of the mammals' prefrontal cortex, which had long been thought to provide the unique machinery for intelligence. Bird brains have a nucleated structure, more like a fruitcake than the mammalian gâteau. Crows, like apes, have

huge brains for their body size, with a massive expansion of the avian prefrontal cortex, as Marzluff and Angell eloquently describe.

Some corvids have formed a close association with humans, and they have featured in myths from around the world — to take just one example, the Nordic god Odin had wise raven companions, Huginn (thought) and Muninn (memory). In real life, the Tower of London is ‘protected’ by raven guardians. The birds' interactions with us can seem mischievous. At Paradise Lodge in Banff National Park, Canada, a raven named Herman is well known for his thievery, snatching bars of soap and packets of porridge from the hotel staff.

But in saying that crows share seven key characteristics with humans, Marzluff and Angell go a step too far, I would argue. Their argument seems informed by a leap of faith rather than fact. The evidence provided for these abilities is anecdotal and observational, rather than the result of a critical analysis and the scientific evaluation of alternative accounts. Although this is a popular book, I would welcome more emphasis on the scientific process, rather than a simple description of the most cognitive interpretation of the end result.

Yet the authors do provide intriguing examples that warrant further empirical, scientific evaluation. By alerting readers to these remarkable instances, they heighten our appreciation of the world of crows and argue that corvids have become something of an essential part of our lives — which “may be their greatest survival tool”.

I hope this is so. In the United Kingdom, crows are classed as vermin — fair game that can be shot from the sky. If they are as intelligent as apes at physical and social problem-solving, then surely their status should be changed. ■

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Incoming! Or, Why We Should Stop Worrying and Learn to Love the Meteorite

Ted Nield (*Granta*, 2012; £9.99)

Geologist Ted Nield charts the history of rocks falling from the sky: from a meteorite worshipped by a Roman emperor to a shower 470 million years ago that coincided with a rise in biodiversity. (See Birger Schmitz's review: *Nature* **471**, 573–574; 2011.)

Weeds: The Story of Outlaw Plants

Richard Mabey (*Profile*, 2012; £8.99)

The concept of weeds is man-made, says naturalist Richard Mabey. By interweaving history, psychology, literature, art and plant biology, he has created a book of wide scope, wrote reviewer Sandra Knapp (*Nature* **467**, 1037; 2010).